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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner: Wolfe, Jr. Willis Ray Docket: MB 375

Applicant(s): Walter Aupperle
Serial No.: 10/622012 In Response to Paper No. 11022004
Filing Date: 17/07/03 Art Unit: 3747

Title: EXHAUST GAS RECIRCULATION SYSTEM FOR AN INTERNAL COMBUSTION ENGINE

Commissioner for Patents
Alexandria, VA 22313-1450
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(pages 1-3)

November 14, 2004

SIR:

RESPONSE TO FINAL ACTION

This is in response to the examiner rejection of the above identificd application dated 11/08/04, which was made final by the Examiner.

The Examiner has again rejected claims 1 – 5 under 35 USC 102(b) as being anticipated by O'Laughlin and he has rejected thc remaining claims as being unpatentable based on O'Laughlin in view of additional refereuces

In his rejection, the Examiner states (based on O'Laughlin) "Notc EGR passage (18, 34, 36) between the exhaust system (16, 17) and intake manifold (32) having a first exhaust high pressure gas cooler (21), EGR valve (19), and second heat exchanger (5) containing a vaporizing liquid (10)."

However, nowhere calls O'Laughlin the heat exchange structure (fins 21) a first exhaust high pressure gas cooler, and nowhere calls O'Laughlin the box 5 a second heat

exchanger (or for that matter any heat exchanger) as the Examiner does. The fact is that the box 5 is not a heat exchanger. And the heat exchange fins 21 therefore do not represent a first gas cooler, but the only gas cooler.

In his Response to Arguments, the Examiner states that "the container contains a liquid to be vaporized by the heat of the EGR" and further "releasing its heat to this liquid inherently cools the re-circulated exhaust gas and therefore the container acts as a heat exchanger that cools the exhaust gas". This again is an incorrect allegation as will be explained to the Examiner below.

The principle of evaporation of a liquid, specifically of water, into a gas is the result of the following phenomenum:

At the surface of a body of water, vapors are formed depending on the partial vapor pressure of the vapor in the gas or air covering the body of water, that is depending on the degree of saturation of the air or gas or, respectively, its relative humidity. As non-saturated air moves across the surface of the body of water, the vapor is absorbed by the air – as long as the air is not saturated. Because of the reduced partial pressure for the vapor at the water surface, new water molecules are evaporated from the body of water and form a new vapor layer above the body of water. The heat required for this evaporation is taken from the body of water where the evaporation takes place – not from the air disposed above the vapor interface layer. The temperature of the body of water drops and the energy content of the air, by which the vapors are absorbed, actually increases. (When those vapors are again condensed – for example. during raining - this energy is again released, in this case to the air where the condensation takes place and the air temperature rises). The water in the box 5 is again heated by the electric power supplied thereto via the electrodes for the dissociation of the water in the box 5.

Example: When you, Mr. Wolfe, get out of a pool, you are wet and you feel cold even if the air is warm. You feel cold certainly not because heat is transferred to your body by the air as it would if your argument were correct. Rather, the water on the surface of your body evaporates into the air and the evaporation heat is provided by the water remaining on your skin which therefore is cooled down. Your body replaces the heat consumed to evaporate the water and you feel cold. The evaporation heat is not provided by the air; it is rather provided by the water droplets out of which the vapor is formed.

The statement in the arguments presented by the Examiner as a reason for the rejection of the present application that is "releasing its heat to the liquid inherently cools the re-circulated exhaust gas and therefore the container acts as a heat exchanger that cools the exhaust gas" is therefore incorrect: The container 5 does not act as a heat exchanger that cools the exhaust gas. O'Laughlin does not say that either. The box 5 simply is not a heat exchanger as alleged in the rejection of the present application.

If the Examiner is still not convinced, consider a comparison between the energy balance of a heat exchanger and that of the container 5 of O'Laughlin:

In a heat exchanger, a warm fluid A enters with a heat energy content Q_A. A fluid B which is cooler than the fluid A enters with a heat energy content Q_B. In the heat exchanger, the heat energy ΔQ is transferred from the fluid A to the fluid B. The fluid A leaves the heat exchanger with the heat energy content $Q_A - \Delta Q$. The fluid B leaves the heat exchanger with the heat energy content $Q_B + \Delta Q$.

In the arrangement of O'Laughlin energy is supplied to the box 5 with the exhaust gas through the conduit 29. Furthermore, energy is supplied to the box 5 by way of the electric circuit 12. All that leaves the box is the exhaust gas through the riser pipe 34. Consequently, all the energy supplied to the box 5 can leave the box 5 only with the exhaust gas through the pipe 34! That is, the exhaust gas leaving the box 5 has more energy than the exhaust gas entering the box: No heat is removed from the exhaust gas entering the box 5 and carried out by another medium as it would occur in a heat exchanger. Obviously, the box 5 is not a heat exchanger!

Consequently, the present application has been rejected on the basis of an incorrect understanding of the principle involved in the evaporation of a liquid into gas and a misreading of O'Laughlin's "fuel economizer".

The Examiner is respectfully requested to reconsider his rejection and allow all the claims as solicited by applicant in the response dated October 14, 2004.

Respectfully submitted,

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